

AIAA Multinational Abstract:

TITLE: CAPTIVE FLIGHT TESTING FOR HIGH FIDELITY KINETIC KILL
VEHICLE INTEGRATION TESTING

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ABSTRACT: We describe captive flight testing as performed by Lawrence Livermore National Laboratory at the Nevada Test Site for high fidelity kinetic kill vehicle (KKV) integration testing. We show how tests progressing from component testing, to hardware in the loop simulations, to hover testing and then directly to flight testing can integrate KKV systems to a moderate degree of fidelity, but cannot test and integrate the essential systems and algorithms necessary in the final second of flight to achieve hit to kill. In particular, we show how essential software and hardware systems required to measure small terminal changes in line of sight rate and exert appropriate divert and attitude control with full coupling of all KKV guidance and control systems can only be tested to the fidelity required for hit to kill if the KKV is allowed to home on a realistic target by diverting realistic distances as it would in a captive flight test or a free flight test. We show that since captive flight test integration of a KKV is at least an order of magnitude less expensive than a flight test, all problems found during captive flight testing more than pay for themselves by avoiding flight test failures and significantly reduce the overall program risk. Further, the rapid turnaround of captive flight test KKV integration supports even the most aggressive integration testing schedule. Finally we give several examples of how readily captive flight testing could be applied to current and planned BMD systems.

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